# First MEMS DGE DWDM

Silicon Light Machines (San Jose, CA, USA) announced its Model 2200 dynamic gain equalizer (DGE) for DWDM communication systems. The Model 2200 represents the next generation of DGE's, providing continuous, spectrally seamless gain equalization in long-haul optical networks.

The Model 2200 is the first such device to employ diffractive micro-electromechanical system (MEMS) technology with ultra-high spectral resolution.

"The Model 2200 DGE is a breakthrough product for Cypress," said Cypress CEO T.J. Rodgers. "It's our first optical networking sub-system, one that leverages SLM's expertise in MEMS and optics as well as Cypress's world-class capabilities in optical networking and semiconductor manufacturing. It's a leading-edge product that further extends our offerings in the optical communications market beyond networking linecards to the long-haul connections between boxes."

The Model 2200 DGE works in DWDM systems, balancing channels within an unprecedented +/- 0.1dB over a dynamic range of 15dB. It independently attenuates optical power over multiple spectral regions, enabling carriers to add/drop channels on demand without affecting adjacent-channel power levels regardless of channel count.

# EpiWorks launches 4-in PD wafers

Illinois-based EpiWorks, Inc., is producing state-of-the-art InP/InGaAs PIN photodetector epitaxial wafers, up to 4" in diameter.

The benefits of the EpiDetector material have been demonstrated with 90 mm mesa diodes employing a 2 mm i-layer. The diodes typically operate with less than 100 pA of leakage current at a 5 V reverse bias. This is an order of magnitude improvement over the current industry standard.

"We have been working with select customers over the past year to develop state-of-the-art pin technology and industry leading procedures for pin production. We have established a capability to provide leading performance and high-volume production," said Dr. Dave Ahmari, EVP of Business Development.

"The limitations of pin photodetector performance are determined by the epitaxial wafer technology, so we need to supply advanced materials that provide distinctive performance capability. Our technology provides two distinct benefits: first, our ultra-pure material allows users to achieve very low dark current, and second, our EpiDetector process provides excellent resistance characteristics for high-speed applications. The EpiDetector™ technology is being used in industry leading pin and TIA components for 2.5, 10 and 40 GB/s applications," said Dr. Nada El-Zein, R&D Director.

# Inphi quartet of modulator drivers

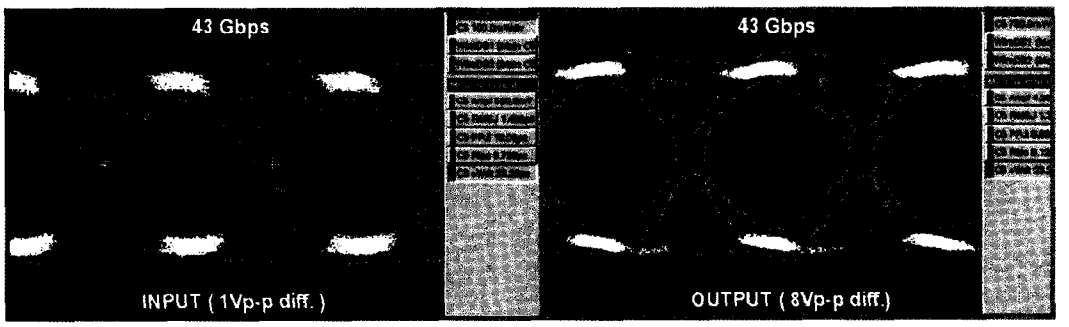
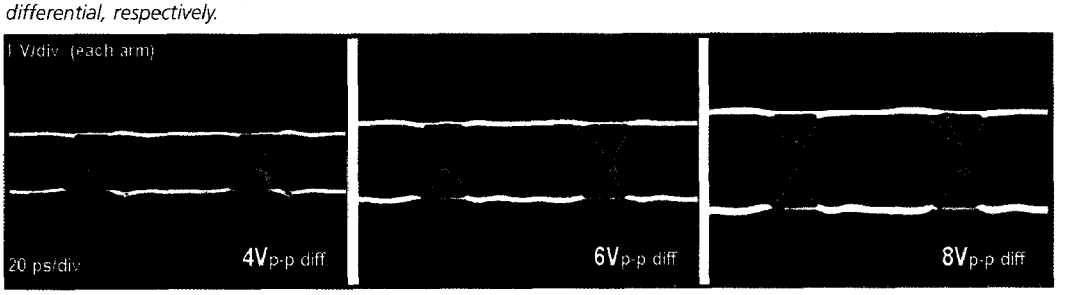



*Figure 1. Input and output eye diagrams for the 4310DZ at 43 Gbit/s.*

Inphi Corp. has introduced high-performance modulator drivers for current and next-generation optical networks. The 4310DZ, 2010DZ, 1310DZ, and 1010DZ support a wide array of single- and dual-drive Mach-Zehnder modulators. The drivers provide network equipment manufacturers with a scalable solution for incorporation into OC-768 and OC-192 transponders and linecards for intermediate reach, long haul, and ultra long haul telecoms. The devices exhibit wide bandwidth and excellent group delay flatness, making them ideal for high-bit-rate transmission. The drivers have substantial gain, which allows direct connection to either single-ended or differential current mode logic (CML) multiplexer interfaces. Inherently high symmetry and low skew between the differential outputs provide optimum drive for even the most demanding modulators. Jitter and eye quality remain constant over the output adjust range to ensure robust network performance. Also, the drivers are all single ICs to provide the highest reliability.

*Figure 2. 10 Gbit/s eye diagrams demonstrating the 1310DZ with output adjusted to 4, 6, and 8 V peak-to-peak differential, respectively.*




The four drivers are currently sampling to Tier 1 customers and are available for sale. Wafer supply agreements and in-house test and packaging capabilities are in place to enable volume production.

Earlier, the company said it had demonstrated InP demultiplexers running at a data rate of greater than 80 Gbit/s. It claims that this speed exceeds results in SiGe, which reached half-rate speeds of only 56 Gbit/s. Moreover, although Inphi's half-rate demultiplexer operates at a much higher speed than the SiGe circuits, it dissipates the same amount of power. At a reduced data rate of 40 Gbit/s, for example, Inphi's half-rate demultiplexer dissipates only 400 mW of power, approximately one third the power of SiGe half-rate circuits operating at the same speed.

# Smallest laser diode driver IC

Atmel Corp., (Heilbronn, Germany) has produced the world's smallest dual-output laser diode driver IC for the next generation of combined DVD/CD-R/RW end products. The T0806 is the latest member of Atmel's successful family of laser diode drivers. A fully functional embedded microcontroller chip set supporting all DVD and CD Writeable and Re-Writeable standards will be announced soon.

The T0806 is a three-channel laser driver with two selectable outputs. Both outputs can either be used for DVD laser diodes with a wavelength of 650 nm or CD-RW laser diodes with a wavelength of 780 nm. The two identical outputs support currents up to 300 mA. Rise and fall time is in the range of 1 ns. This allows the development of DVD/CD drives with re-write speeds of 4 to 8 for DVD and 16 to 24 for CD, which is about 100% faster than currently available drives.

# Tripartite pact for standardized optoelectronic product definition

Alcatel Optronics (Paris, France), CyOptics (Waltham, MA, US) and Oki Electric Industry Co. (Tokyo, Japan) have formed a joint effort to define a multi-source agreement (MSA) for 40 Gbit/s electro-absorption modulator (EAM) based products.

With its small footprint, high compactness and low electrical power consumption, EA technology is very well suited to 40 Gbit/s optical interconnection applications and long distance WDM telecom transmissions. To allow customers to benefit from the availability of compatible devices, Alcatel Optronics, CyOptics and Oki Electric recognize the importance of standardizing their respective 40 Gbit/s electro-absorption based products.

The three companies will work closely to define a MSA as soon as possible. This MSA is expected to have multiple phases. The first one covers pin-out and footprint standardization and is expected to be completed by the end of 2002. This will be followed immediately by standardization of the performance specification.

"We are proud to extend the previously demonstrated advantages of MSAs to 40 Gbit/s modulation, providing a future proof solution allowing our customers to be confident of their 40 Gbit/s development," explained Philippe Bregi, Chief Operating Officer of Alcatel Optronics. "Our company will continue to push standardization of optical components as it is the best way for system houses to avoid costly and time consuming system redesigns."

"This MSA will benefit our customers by significantly lowering the risk of adopting a cutting edge technology. CyOptics is very excited to be part of this co-operation effort with other EAM suppliers," said John Pilitsis, CEO of CyOptics. "Oki believes this kind of joint effort for the MSA is definitely important to make customers accelerate, more significantly, the adoption of the 40 Gbit/s EA modulator/driver on transmission systems," said Tetsuzo Taniguchi, President of Optical Components Company at Oki Electric.

The electro-absorption technology is used in compact products such as EAMs and EAM lasers with the possibility to integrate a driver circuit in the module. Thanks to its high bandwidth and low drive voltage, EA technology helps reduce power consumption and allows tighter integration within system cards.

The trio will independently develop and market products based on this standard.

## Temperature-tunable DFB laser module from QDI

Quantum Devices, Inc., (Yorba Linda, CA, USA) Lambda Light narrowly tunable DFB laser module is now available with up to 15 mW optical output power. Lambda Light is ideal as a primary or spare source laser module for today's point-to-point WDM, low speed wavelength routed networks, optical add/drop, and precision test/measurement applications.

The temperature-tuned Lambda Light is available in both a CW version with up to 15 mW power and a directly modulated version up to 2.5 Gbit/s with over 5 mW of peak optical output power. Lambda Light is continuously tunable over 4 adjacent ITU wavelengths at 100 GHz spacing or 8 adjacent ITU wavelengths at 50 GHz spacing. Available wavelengths span the full C-band, with centre ITU wavelengths from 1530 nm to 1565 nm.

"DFB lasers are the laser of choice for WDM applications. These lasers are extremely reliable and field-proven to be wavelength stable over years of operation," said Mo Mazed, president and CEO of QDI.

Lambda Light incorporates a phase-shifted InP DFB laser chip technology and is packaged in an industry standard 14-pin butterfly hermetic electro-optical module that is compatible with existing fixed wavelength DFB laser modules.

## Cree blue laser life up to 10 000 h

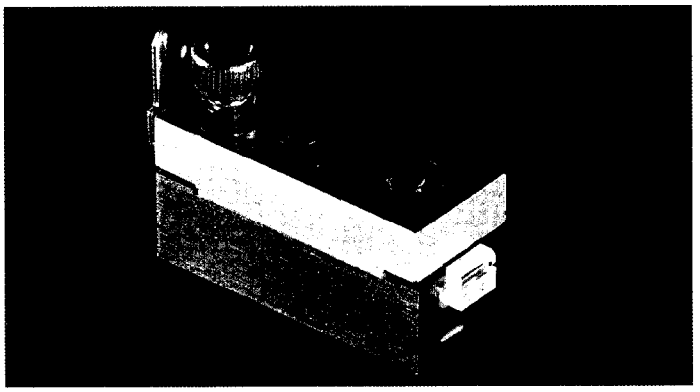
Cree, Inc., (Durham, NC, USA) announced that the latest results for its 405 nm, 3 mW blue laser diodes exhibit a projected lifetime exceeding 10,000 h at room temperature. The company started sampling its laser diodes in December 2001 and evaluation is underway at major electronics DVD manufacturers.

The company believes its blue laser diodes under development will have specifications suitable for the recently announced uniform standards for the next-generation optical disc format designed to succeed the DVD.

Chuck Swoboda, President and CEO said, "This is one of the most significant achievements in the history of the company. We have accelerated our blue laser diode development and continue to target a product launch by the end of this fiscal year. We believe these diodes will meet the uniform standards being formulated and look forward to participating in the exciting new optical disc applications under development."

The new blue laser format will feature up to 27 Gb of memory on one side of a single 12-cm disc, nearly six times the capacity of current 4.7 Gb discs, and could store approximately 40 h of ordinary TV broadcasts and more than 2 h of digital high-definition motion pictures. Blue and UV lasers, with a shorter wavelength than red lasers, could also benefit optical storage systems such as high-end mass storage optical recording systems, enabling them to read and write more bits of information on a given area of disc space.

# High power diode laser



Coherent Inc, Semiconductor Division (Santa Clara, CA, USA) introduced a 500 µm broad-area emitter device rated at 7 W, CW. Part of its family of Al-free NIR (790 nm to 813 nm) OEM components, this new diode laser is ideal for integration into a host of direct-diode thermal, medical and industrial applications, as well as a pump source for Nd-based , diode-pumped, solid-state lasers.

The OEM single-stripe diode laser is mounted on an industry-standard (10.5 x 25 mm) conduction-cooled package. Typical drive current and compliance voltage for the device is less than 8 A and less than 2 V. Spectral width is typically less than 2.5 nm, FWHM. Beam divergence is less than 35° by 10°, FWHM.

"Essentially, our product provides the highest CW optical power commercially available on the market from a 500-micron broad-area single-emitter device, mounted to a narrow, conductively cooled package," said Michael Atchley, product line manager for CSD. "This higher power rating will allow customers to upgrade their design performance without having to sacrifice size or reliability."

# LED integrated array in many colours

Lumex Inc., (Palatine, IL, USA) is producing its new 'Intelligent' 10-Segment LED Array. This completely integrated unit includes ten horizontally-lit bars plus programmable driver circuitry, all mounted on a mini circuit board which can either be plugged into a connector or soldered directly into a circuit. The LED array is a linear-scaled display ideal for OEMs designing power, voltage, or VU meters in applications such as process control panels, consumer audio equipment and professional sound equipment.

This assembly has ten horizontal 1.27 x 4.06 mm windows. Lumex can provide virtually any colour - or combination of colours - of LED technology available. The programmable on-board driver allows the intensity of the individual bars to be adjusted electronically. This driver also accepts a control signal to change the display from a "bar graph" type, to a "moving dot" type.

Lumex's Intelligent 10-segment LED array is packaged on a circuit board measuring 50.55 x 21.59 mm, and has 12 gold-plated contacts along its lower edge. It accepts an analog signal input, and it operates from a single voltage power supply. Depending on the LED chip selected, the entire unit can operate on a supply voltage of 3 to 15 VDC.

## Technology: Optoelectronics

**SEMICONDUCTOR**

mo..., CA, USA, based Bandwidth9's MetroFlex G2 ... Tunable Optical Transmitter for metro optical network ... wavelength applications ... a transmitter solution for ... wavelength configuration and sparing applications targeted ...cing operational costs ... metro optical networks. Featuring an ultra-small form fac... odBm output, the ...x G2 is substantially similar to the size and power requirements of fixed wavelength transmitters, enabling a seamless transition to Bandwidth9's tunable technology within fixed wavelength architectures.

**Cutting Edge Optronics, Inc.** (St. Charles, MO, USA) semiconductor laser group offers a variety of high power, lensed diode arrays, typically over 20 W, in the 780- to 1000-nm wavelength range. The wholly owned division of TRW can evaluate customers' specialized needs to adapt a flexible packaging system to suit custom applications. It is also offering microchannel cooled laser pump bars and packaged arrays. Using an ultra-compact design, the 40 W bar is available in an 808 nm wavelength and can be fast or slow axis lensed.

**Dynatex International,** (Santa Rosa, CA, USA) has begun a Contract Service for separating die for numerous applications and emerging markets to create an optimal production methodology. It employs expertise both in traditional device separation using wet process saw dicing blades and in dry process scribe/break separation. For example, Dynatex engineers and cleanroom are available to provide superior services for dry process dicing and laser bar cleaving.

# Osram LEDs feature inside and outside Ford concept vehicle

Osram Opto Semiconductors (Regensburg, Germany) has announced that its advanced illumination technology is being used on the 'Mighty F-350 Tonka' concept vehicle.

The Mighty F-350 Tonka is the first Ford truck to be fully equipped with Osram OS high-flux Power TOPLED products throughout the vehicle's interior and exterior: low beam headlamps, fog lamps, running board lamps, signal lamps including the rear combination lamps (RCL), centre high mount stop lamps (CHMSL) and back-up lamps.

Developed in 1998, the exceptionally compact Power TOPLED® is the first high-brightness surface mountable LED to be applied to an automotive exterior lighting application.

LED technology provides multiple advantages over incandescent lighting, ranging from reduced power, improved reliability, more compact packaging and more flexible optical designs. LEDs are more efficient than incandescent lighting, reducing power consumption by 50% of the power as compared to incandescent lamps.

The power saving associated with LED technology (estimate 300 W savings/vehicle) will result in improved power consumption and vehicle fuel economy.

According to Tom Shottes, Director, North America LED Products, "due to the rapid improvement of white LED efficiency, Osram OS LED technology will soon replace incandescent lamps in such white lighting applications as LED headlamp solutions, and back-up and license plate lamps, enabling OEMs with a unique styling signature theme not available with incandescent lighting.

"When applied to marker lights such as side and turn signals, LEDs can provide quicker response and reaction time while on the road."

Osram Opto has also revealed that its advanced white LED lighting is being applied on the 2002 Lincoln Navigator which is being featured at the 2002 Chicago Auto Show and other upcoming shows. Using Osram OS' white Power TOPLED lighting technology, the Lincoln Navigator is the first North American vehicle brand to harmonize the vehicle's interior lighting. The Lincoln's 'Satin Nickel' dashboard theme is achieved through the consistent and uniform appearance in colour and brightness throughout the interior of the vehicle.

Osram OS assisted Ford Motor, as the lighting integrator, to assure that all Lincoln switches, radios, climate controls and PRNDL applications achieved a common harmonized theme with the use of Osram OS' patented white lighting technology that includes TOPLED®, SIDELED® and 3 mm Radial packages. The desired style and appearance was achieved by Osram OS' process of optimizing the LED colour and intensity selections for the vehicle interior illuminated applications.

As a result of this innovative technology and partnership, Osram OS has been selected as a finalist for the 2002 Automotive News PACE (Premier Automotive Supplier and OEM's Contribution to Excellence) Award.

Achieving the proper white colour selection for Lincoln was attained through the use of a blue LED dye and yellow phosphorus converter material. Osram OS has the ability to manufacture white LEDs with specific colour tolerance in high volume.

According to Tom Shottes, Director of North American LED Products, "delivering an entire brand theme to the OEM is a proven competency of Osram OS."

"The execution of such a challenging white colour theme is an indication of the expertise that our local team can deliver." Shottes also adds, "the execution of such colour themes through effective supply chain management with advancing LED technology will be a key enabler in our ongoing growth in the North America automotive LED market."

"There are many technical advantages to using white LED lighting technology," explained Shottes. "These advantages include longer life and higher reliability. In addition, LEDs are more efficient than incandescent lighting using up to 50% less power and generating far less heat. With the rapid improvements in white LED efficiency, LEDs will continue to replace incandescent lighting applications giving OEMs the freedom to design unique styling and illumination themes not attainable with conventional incandescent lighting."